Disease of Mango

Anthracnose Disease

Causal organism: *Colletotrichum gloeosporioides.*

Symptoms

All the growing stages of mango are infected by this pathogen.

On Leaf: Oval to irregular greyish brown spots develop on the leaves. Infected tissues drier and shriveled. Infected leaves and on petioles drop and die.

On Twig: Young twigs and stems are infected. Greyish brown spots firstly appear which gradually enlarged and girdle the stem and ultimately Die-back.

On Inflorescence: Black, minute, dot like spots develop on the floral organ. When the spots develop, the infected flowers become dry and fall off prematurely. When infestation is high, complete deblossoming.

On Fruits: Initially water soaked lesion develop on the young fruits which later become dry, sunken and black. Flesh will be stiff, skin of the affected fruits become splitted.

Control Measures

1. Growing of resistant varieties.

2. Spraying with Bordeaux mixture 3-4 times before/during flowering or before harvesting. No spraying at blossoming.

3. Proper sanitation.

4. Irrigation at regular interval.

5. Dipping in hot water at 50^0C for 5 minute after harvesting.

6. Application of Benomyl 500 ppm and Thiobendazale solution.

7. Spraying with Tilt @ 5 mL/L of water.

Diplodia stem end rot

Causal organism: *Botryodiplodia theobromae.*

Symptoms

Initially black spots appear on the pericarp near the end of pedicel. Under favourable conditions, the spot sprayed rapidly and ultimately the whole fruit become black. The pulp becomes brownish and soft. The fruit losses ascorbic acid rapidly and sugar content become low. If we push our finger on the affected fruit, the finger will be pushed down and emits bad smell.

Control Measure

1. Collection and destruction of infected plants.
2. Proper care during harvest-
    a) Care should be taken so that 2-3 cm pedicel remain with the fruit.
    b) It should be shifted in the ripening house immediately with proper wrapping.
    c) No injury in the package house.
3. Dipping in 5 % Borax solution with 43^0C temperature for 3 minutes.
4. Wrapping with oily paper individual fruits.
5. Box in the truck should be disinfected with formalin solution.
6. Spraying fruits with Dithane M-45.
7. Dipping fruits at 12-15^0C temperature, as a result the fruits will neither ripen nor rotten.

Powdery mildew of mango

Causal organism: *Oidium mangiferae.*

Symptoms

Whitish or greyish powdery mass appear on the tip of the inflorescence which appear upto the flower axis, young leaves and the stem. As they affect the flower before fertilization as well as young fruits when they are lentil like appearance. Affected flowers and fruits fall off pre-maturely. Mature fruits will be discoloured and malformed.

Control Measure

1. Proper Sanitation.

2. Spraying with wettable sulphur dust @ 0.2 % solution before flower initiation and after fruit development.

3. Spraying with Dithane M-45/Bordeaux @ 0.3 % solution.

4. Spraying with Thiovit @ 0.3 % solution.

Disease of Jackfruit

Rhizopus fruit rot of Jackfruit

Causal organism: *Rhizopus artocarpi.*

Symptoms

Initially water soaked lesion developed from the young fruit below pedicel. Infection occurs in the both male and female flower and also young fruits. This lesion later spread and cover the whole flower and fruit. If we touch the affected portion, it feels very soft. Fungal mycelia and spores are found to be attached with the infected fruits.

Control Measure

1. Clean cultivation.

2. Organic manures pit shouldn't be kept on the Jackfruit garden.

3. Spraying with Dithane M-45 @ 0.3 % solution, Tilt @ 0.2 % solution at the time of flower and fruit development.

4. Spraying with Bordeaux on inflorescence and small fruits.

Fruit rot of Jackfruit

Causal organism: *Phytopthora palmivora.*

Symptoms

Usually these Jackfruit with rough surface get severe attack than smooth surface. If the pathogen get any injury on the fruit surface, then it developed a water soaked lesion and grows vigorously on that areas. Ultimately the area become rotted and turn brown to black. Mycelial growth and sporangiospores are found at the margin of the lesion, if enough moisture is present.

Control Measure

1. Spraying with Bordeaux @ 0.2 % solution.
2. Spraying with Cupravit @ 0.3 % solution.

Disease of Banana

- **Panama disease-** *Fusarium oxysporum f. sp. cubense.*
- **Sigatoka or Cercospora leaf spot-** *Cercospora musae.*
- **Bunchy top-** Banana buncy top virus.
- **Anthracnose/ Black rot/ Ripe fruit rot-** *Colletotrichum musae.*

Panama Disease

Causal organism: *Fusarium oxysporum f. sp. cubense.*

Origin

This disease first recorded in Panama in the year of 1904.

Symptoms

The disease appear at any stage of growth. Usually older, lower leaves of the banana plant get first attacked. Yellowish discolouration appear at the margin of leaves and gradually moves towards the mid ribs and cover whole leaf. Due to necrosis, the colour of the affected area turns brown to blackish. Due to attack midribs, the petiole breaks down and the leaf remain hanging with it. Within 4-6 days the whole leaf of a plant become black and dead of remain hanging with the bark. In case of severe attack, the pseudostem is splitted out longitudinally and break down at the base. If we naked a section of rhizome, the vascular tissue will be found yellowish and reddish. Most of the affected plant do not bear any flower and bunch. But if bunch is developed, the fruits become small, narrow, curve and deformed. Affected fruits become hollow inside and shows irregular ripening.

Source of Infection

Affected sucker, Rhizome, Pseudostem, fruit, infected soil, heavy soil (acidic soil called H.S.), alternate host.

Favourable condition

i. Low pH of soil.

ii. High N and moisture content.

iii. More the root more the disease.

iv. More the age less the disease.

v. High inoculum potential increase disease severely.

vi. Cultivation of Brinjal with banana.

vii. Heavy soil.

Transmission

Infected sucker, flood water, Irrigation water, drainage water are the source of transmission.

Control Measures

1. Collection of sucker from disease free plant.
2. Disease material should be cut and burn.
3. Cultivation of resistant varieties- Kabri banana.
4. Destruction of alternate host like as Solanaceous crop and avoidance of cultivation them.
5. Proper drainage.
6. Cultivation of banana in high land.
7. Application of lime to the soil.
8. Crop rotation should be followed.
9. Application of nematocides and mixing with soil of Furadan.
10. Spraying with Tilt @ 0.4 %.

Sigatoka Leaf spot/Cercospora leaf spot

Causal organism: *Cercospora musae.*

Origin

This disease first recorded in Sigatoka valley in Fiji in the year of 1913. It also found in Java Island in 1902.

Symptoms

Initially many oval spindle shaped spots appear on the leaf parallel to the vein. The spots are greyish center surrounded by yellow halo with dark brown margin. Lower leaves near the soil get early attacked. Several spots may coalesce and the leaf become blighted. Petiole and mid rib also attacked. The fings are also attacked; fruits become smaller and ripening before maturity and they ripe unevenly.

Sources of Infection

Diseased plant, attacked leaf, shed leaves, crop residues, ascospore, dormant Mycelial, perithecia etc.

Transmission

Wind, Rain splash, Dew, Water drop etc.

Favourable Condition

1. Usually the plants with more number of leaves get attacked earlier.
2. Close spacing.
3. Rainy, hot and humid climate.
4. Temperature 23-25^{0}C, Relative humidity greater than 70 %.
5. Lack of proper drainage.

Control Measures

1. Field sanitation.
2. Collection and destruction of weed.
3. Wide spacing.
4. Proper drainage.
5. The leaves nearing the soil should be cut and removed.
6. Planting resistant variety.
7. Spraying with Tilt @ 0.2 % solution 2 times before rainy season and 2 times after rainy season.
8. Spraying with Dithane Z-78 0.3 %.
9. Application of Bordeaux mixture @ 0.2 %.

Bunchy Top

Causal organism: Bunchy top virus.

Origin

This disease first recorded in Fiji in the year of 1891.

Symptoms

The virus is persistent. The leaves become narrow, small and remain upright condition at the top of the plant. The leaves become chlorotic and petioles become dark green. Some black dot like structure present on the midribs. Rosette symptoms in leaf develops. i.e. Before opening of a leaf completely, another leaf start growing and fall may cluster, Margin of the leaves become waxy, fruit bearing capacity of the plant will be either Poor or Zero. In case of mature plants, mosaic pattern develops of the leaf surface. The mid rib will be blackened. Infected plant fail to bear bunch. If bunch develop, they appear by bursting of the pseudostem. The sign of the fruit become smaller and deform. The fruit neither ripe nor mature. If we make a transverse section of rhizome, vascular bundle is found becomes stiff with hydrous tissues.

Source of Infection

1. Diseased sucker and plant.
2. By vector like as Banana aphid *(Pentalonia nigronervosa)*.

Favourable condition

1. Rainfall in summer.
2. Rich soil in shaded condition.
3. Age of plant.
4. Temperature along with other factors.

Dissemination

Through banana aphid, Wind, Infested sucker and intercultural implements.

Control Measure

1. Planting of healthy sucker.
2. Destruction of disease sucker as early as possible.
3. Maintain quarantine regulation.
4. Spraying with aphidicides before cutting the disease plant.

Disease of Citrus

Die-back Disease

Causal organism: *Colletotrichum gloeosporioide.*

Symptoms

1. Firstly upper leaves becomes yellowish and start drops, then upper portion start to die.
2. Colour changes into straw colour.
3. Numerous dot like structure present on the stem.
4. A ring like band develop on the infected region and healthy region.
5. Leaves may fall with onset of summer or autumn and the small branches and twigs become dry.
6. Ultimately great loss of yield occur.

Favourable condition

High temperature and humidity. Temperature 25-32^{0}C, Relative humidity 70-80 %.

Control Measure

1. Proper sanitation.
2. Adequate amount of K and Zn fertilizer should be applied.
3. Spraying with Dithane M-45, Dithane Z-78 @ 0.2-0.3 % solution.
4. Removal of infected portion of stem then cut portion should be burnt.
5. Good cultural practices should be performed.
6. Avoid water logging condition.

Scab of Citrus

Causal organism: *Elsinoe fawcetti.*

Symptoms

1. Corky spots are developed on the surface of leaves and fruits.
2. The spots become watery and scaby in nature.
3. Every spot is surrounded by yellow halo.

4. Few corky spot coalesce together and looks ugly.
5. Fruits become smaller in size.
6. Severely attacked fruits become weak and shed down.
7. Sometimes fissure develop on the fruits.
8. Sometimes die back symptoms appear.
9. The color of the spots turns from yellow to orange brown and finally black.
10. The leaves may sometimes wrinkled and misshapen due to occurrence of several spots.

Favourable condition

1. Wet weather.
2. Temperature greater than 20^0C, humidity greater than 80 %.
3. Excess fog and dew.

Control Measure

1. Diseased fruits, leaves and weeds should be destroyed.
2. Supply of balanced fertilizer in the nursery plant.
3. Reduce infestation by wider spacing.
4. Zinc sulphate and Ash may be mixed with soil.
5. Spraying Bordeaux mixture.

6. Spraying Copper fungicide like Cupravit 50 WP @ 0.4 % one after rainy season and other before the rainy season.

Disease of Coconut

- **Gray leaf blight-** *Pestalotiopsis palmarum.*
- **Bud rot-** *Phytophthora palmivora.*
- **Stem bleeding-** *Ceratocystis paradoxa.*
- **Immature Nut fall-** *Phytophthora arecae, Phytophthora palmivor.*

Gray leaf blight

Causal organism: *Pestalotiopsis palmarum.*

Symptoms

At first pin headed brown spots are found on the older leaf. The spots gradually enlarged and become elliptical. The spots become chocolate colour. The center of each spot is greyish or brownish which is surrounded by yellow halo. Sometimes two or more spots are coalesced and produced a larger spots. As a result, a larger portion of the leaf become blighted. The spots may spread to the entire leaf. Severely attacked plant bear fewer fruits. As a result yield is greatly reduced.

Source of Infection

Plant debris, alternate host, Date and Supari tree.

Favourable condition

High temperature (28-32^{0}C) and Relative humidity (>80 %).

Control Measure

1. Proper sanitation.
2. Cleaning of coconut head.
3. Use of balanced fertilizer.
4. Application of Zn containing fertilizer. e.g. Zineb, Dithane Z-78 @ 0.2 % solution 2-3 times at 15-20 days interval.
5. Spraying with Bordeaux mixture.

Bud Rot

Causal organism: *Phytophthora palmivora*

Occurrence

At first Indian Pathologist Butler, reported this disease in 1906.

Symptoms

At first, the central upper leaf starts yellowing, gradually die. If we pulled out the leaf, it is automatically come out. Due to rotting of the central portion, then the other leaves become affected. In severe condition, all the leaves shed down and only the bare stem remain exposed which may or may not be bear few leaves. The pathogen also attacked the bunch of the fruit.

As a result, the base of each fruit become rotted and fruits fall off prematurely. The affected whole area looks ugly which emits foul smell. Slimy substances exudate from the affected area.

Source of Infection

Infected plant debris, Crop residues.

Favourable condition

- High temperature and humidity.
- Maximum disease occur in July-August.

Control Measure

1. Proper sanitation.

2. Cutting of the infected plant and should be burnt.

3. Scrapping out the infected area at the early stage with a sharp knife and then the cut portion should be painted.

4. Spraying Bordeaux mixture, Redomil @ 0.3 % solution.

Stem Bleeding

Causal organism: *Ceratocystis paradoxa.*

Symptoms

At first a longitudinal necrotic lesion develop on the stem, later it turns brown and burst. A reddish brown gummy substance is secreted from the affected area. If we cut the surface area of the affected region, the inner tissues found yellowish brown. Special kind of hole is developed at the top of the affected plant at severe condition which gradually enlarge and killed the plant. If the plant get attacked at young stage, it will be died but if infection occur at mature stage, it starts to wilting. The infected plant hardly die but stands.

Favourable condition

- Presence of any enemy on the stem.
- Nutritional imbalance.

Control Measure

Tree surgery and pasting with coal, Bordeaux paste.

Fruit Drop

Causal organism: Many factors are related.

Causes of fruit drop

1. Long drought.
2. Nutritional imbalance; K, P, B, Ca, Zn deficiency.
3. Less moisture content of soil.
4. Application of excess nitrogenous fertilizer.
5. Attacked of fungi; *Colletotrichum* spp, *Botryodiplodia* spp.
6. Attacked of bacteria; *Pseudomonas* spp.
7. Attacked of virus; Tresteza.
8. Attacked of insect and mites.

Control Measure

1) Spraying with pesticides.
2) Application of Borax, $ZnSO_4$, $Ca(SO_4)_2$.
3) Avoidance of heavy N application.
4) Application of irrigation water.
5) Spraying with 1 % potassium (K) solution before flowering.

Disease of Guava

Die-back and Wilt

Causal organism: *Fusarium oxysporum* f.sp. *pisidii.*

Symptoms

A few of the leaves start yellowing. Gradually, this yellowish leaves turn brown and become necrotic, dried and finally shed. Then the branches start drying from the top (If the plants get attacked within 1-2 years, the whole plant dry and die). The plants usually start drying from one side and gradually from other. Cambium zone will be found to be black in the cross section.

Favourable condition

1) High temperature and high humidity.
2) Damp soil condition.
3) Force of winds.

Control measure

1. Uprooting and destruction of affected plants.
2. Planting resistant varieties. e.g. Supreme, White guava, Banarasi etc.
3. Soil amendment with $Ca(OH)_2$, $CaSO_4$.
4. Application of organic manure. e.g. well decomposed cowdung, oil cake etc.
5. Putting excess amount of soil at the base of guava plant during rainy season.
6. Application of Nematocide. e.g. Furadan/ Miral @ 5 g/plant to control the infection of nematode.
7. Spraying with Redomil @ 0.2 % solution.
8. Removing of bark enclosing the stem like a ring and height of 1-1.5 feet from the ground level and then covering the portion with Tar or paint or Mobil.

Disease of Pineapple

Fruit rot/Base rot/Leaf spot

Causal organism: *Ceratocystis paradoxa.*

Symptom

Initially spots with dark margin with greyish center appear on the leaf. The spots gradually enlarge and become olive green. Water soaked lesion developed on fruit, later this lesion turn into yellow colour. The affected fruits become necrotic and ultimately rotten. Sometimes the pathogen also affect the base of the plant causing died of the plant.

Source of Infection

Cut ends, wound, injury etc.

Control measure

1. Field sanitation.

2. Destruction and removal of affected plant and plant parts.
3. Cultivating resistant varieties or with the sucker collected from disease free area.
4. After harvest, the fruit would be kept exposed in the sunlight for 2 hours.
5. Dipping the infected fruits in 10% benzoic acid or alcohol solution.
6. Store house and container should be disinfected with 3% formalin solution.

Heart Rot/Stem Rot

Causal organism: *Phytophthora parasitica.*

Origin

This disease was first reported by Chowdhury (1915) in India.

Symptom

At first the central leaf losses it turgidity. Gradually turns yellow following twisting. The tissue become necrotic brown and finally died. If we try to pull up the infected leaves, it easily pulled out. Inner tissues are found to be black. Infection also goes to the root. Finally the whole plant will die and dried.

Source of Infection

Cut ends, wound, injury etc.

Favourable condition

1) High temperature and humidity.
2) Poor drainage condition.

Control Measure

1. Proper drainage system should be maintained.
2. Treatment of the sucker with Bordeaux mixture (4:4:1) before planting.
3. Growing resistant varieties.

Papaya Disease

- Damping off/Collar Rot/Foot Rot/Stem Rot. **C.O.** *Pythium aphanidermatum.*
- Papaya Mosaic. **Causal organism:** Papaya Mosaic Virus.

- Papaya Leaf Curl. **Causal organism:** Tobacco leaf curl virus.
- Anthracnose. **Causal organism:** *Colletrotrichum gloeosporioides.*
- Stem end Rot. **Causal organism:** *Botryodiplodia theobromae.*
- Rhizopus soft rot. **Causal organism:** *Rhizopus stolonifer.*
- Root knot. **Causal organism:** *Meloidogyne* spp.

Papaya Mosaic

Symptom

The disease appears as profuse mottling and chlorosis of the top young leaves. The leaf petiole is reduced in length and the top leaves assume an upright position. Older leaves become defoliated and a tuft of small leaves are appear at the top. In acute stage, leaves are after modified into finger like structure. The fruits on disease plants develop circular, water soaked lesion with a central solid spots. The fruit on diseases plants are elongated and reduce in size. In severe infection, the plants have only a few small chlorotic and tendril like leaves and failed to flower.

Source of Infection

- Diseased plant, Contaminated soil, Crop residues.
- Papaya mosaic virus are not seed borne. It transmitted by insect vector such as *Myzus persicae*, *Aphis malvae*, *A. medicaginis*, *A. gossypii*. It can be transmitted by mechanically also.

Control Measure

1. Spraying with systemic insecticide (Malathion/Sumithion) to control vector.
2. Cultivation of resistant varieties is only way to avoiding the disease.
3. Weekly spray with 1% groundnut oil help in prevent infection by aphid.
4. Uproot affected plants and burn them immediately.
5. Insecticide Admire 200 SL @ 0.25 ml/ L of water at 15 days interval should be applied to control aphid.

Damping off/Collar Rot/Foot Rot/Stem Rot

Causal organism: *Phythium* spp, *Sclerotia* spp, *Rhizoctonia* spp.

Symptoms

Initially water soaked lesions developed on the stem of seedlings near the ground level. This lesions enlarge and gradually turns brown and girdle the stem. The xylem system of the plant become blocked. As a result, they cannot uptake water/nutrient from the soil. The lower leaves turns yellow, upper leaves become reduced in size and deform.

Source of Infection

Nursery bed, contaminated soil, Crop residues, Irrigation water etc.

Transmission

The pathogen remain as oospores under adversed condition. In low temperature, the pathogen produces zoospores but a high temperature is produces germ tube.

Favourable condition

▲ High temperature of soil.

▲ High humidity.

▲ June-August is favourable for disease development.

Control Measure

1. Collection of Seedling from damping off free nursery bed.
2. Drainage system should be improved.
3. Care should be taken to avoid injury during intercultural operation.
4. Preparing of nursery bed before rainy season.
5. Spraying with 0.1% Savlon on soil at initial stage.
6. Wrapping of the affected collar with cotton bag soaked in 0.1% savlon solution.
7. Soil treatment with 5% formalin.
8. Seed treatment.